

## I. Purpose

The Virginia Department of Environmental Quality (VDEQ) – Division of Air Quality has been requested by the Air Pollution Control Board (the Board) to prepare State Operating Permits (SOPs) for the operation of five coal-fired boilers at the Mirant Potomac River Generating Station (PRGS) facility. This document sets forth the background information used to create a record for the proposed permits.

## II. Facility Background

PRGS is a 482-MW electricity generating facility located on the Potomac River in Alexandria, Virginia. Mirant Potomac River, LLC (formerly Southern Energy Potomac River, LLC) purchased the Potomac River Station from the Potomac Electric Power Company (PEPCO) in December 2000. It consists of five tangentially-fired boilers (Units C1, C2, C3, C4, and C5), each supplying steam to a steam turbine electrical generating unit. Each unit burns coal which is delivered by rail car to the facility. Electricity generated at the facility is transmitted to Washington D.C. for use by variety of customers including federal agencies, businesses, and the D.C. Water and Sewer Authority's Blue Plains Wastewater Treatment Plant. Number 2 fuel oil, stored in two aboveground storage tanks, is fired in the boilers for ignition, warm-up, and flame stabilization. Each unit's gas stream is discharged into the atmosphere through a dedicated stack for that unit. The five stacks are identical and are 161 feet above ground level.

**Table 1: Summary of PRGS Combustion Units**

Unit ID	Manufacturer	Description	Maximum Rated Input Heat Capacity (mmbtu/hr)	Generation Capability (MW)	Began Service
C1	Combustion Engineering, Inc.	Natural circulation, tangentially coal-fired with superheater and economizer	970.1	93	1949
C2	Combustion Engineering, Inc.	Natural circulation, tangentially coal-fired with superheater and economizer	970.1	93	1950
C3	Combustion Engineering, Inc.	Controlled circulation, tangentially coal-fired with superheater, single reheater and economizer	960.7	108	1954
C4	Combustion Engineering, Inc.	Controlled circulation, tangentially coal-fired with superheater, single reheater and economizer	960.7	108	1956
C5	Combustion Engineering, Inc.	Controlled circulation, tangentially coal-fired with superheater, single reheater and economizer	960.7	108	1957

Units 1 and 2 are cycling units that offer more flexibility in how they are dispatched. Cycling units can be brought online quickly to

respond to increases in demand. Units 3, 4 and 5 are considered baseload units and are called into service more often than Units 1 and 2. The baseload units typically run 24 hours a day

The facility is a Title V major source of sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>10</sub>), and carbon monoxide (CO). This facility is located in a nonattainment area for ozone (“moderate” designation) and nonattainment area for PM<sub>2.5</sub> (no designation assigned by EPA at this time). The area is in attainment of the standards for all other pollutants. The VDEQ-Northern Virginia Region Office is currently drafting the Title V permit and Statement of Basis for the facility.

Because the units are grandfathered, there are no NSR permits applicable to this source. The facility entered in to a consent order with VDEQ on July 10, 1998 to establish Reasonable Available Control Technology (RACT) for NO<sub>x</sub> as required by the Virginia State Implementation Plan. A state operating permit dated June 5, 2000, was issued to the facility to establish RACT for VOC. The facility is also regulated under a Phase II Acid Rain Permit dated February 28, 2003, and a state operating permit dated September 29, 2000, for control of NO<sub>x</sub> during the ozone control season, May 1<sup>st</sup> through September 30<sup>th</sup>.

### **III. Pollution Controls**

Each boiler (C1, C2, C3, C4, and C5) has a hot-side and a cold-side electrostatic precipitator (ESP), on its boiler exhaust gas stream to control particulate emissions.

Mirant installed Low NO<sub>x</sub> Burners (LNB) on all units (C1, C2, C3, C4, and C5) and Separated Over Fire Air (SOFA) technology on units C3, C4, and C5 as a result of a 2004 judicial consent decree settlement.

LNB limit the formation of NO<sub>x</sub> by controlling the stoichiometric and temperature profiles of the combustion process in each burner zone. Emissions are controlled by the design of the LNB which may reduce oxygen levels in the combustion zone (limits fuel NO<sub>x</sub> formation), reduce flame temperature (limits thermal NO<sub>x</sub> formation), and/or reduce residence time at peak temperature (limits thermal NO<sub>x</sub> formation).

The SOFA is a technique that involves removing a percentage of combustion air and adding excess air above the burners. This limits thermal NO<sub>x</sub> by partially delaying and extending the combustion process resulting in less intense combustion, and lower flame temperatures. It also suppresses the fuel NO<sub>x</sub> formation by reducing the concentration of air in the combustion zone where volatile fuel nitrogen is evolved. The SOFA can reduce NO<sub>x</sub> by 20 to 30 percent from uncontrolled levels, and can be turned off.

Beginning in 2005 Mirant employed the use of Trona to reduce SO<sub>2</sub> emissions that demonstrated modeled NAAQS exceedences. Trona is a naturally occurring mineral, sodium sesquicarbonate, which is non-hazardous and non-flammable and similar to baking soda. It is used in dry sorbent injection systems where it reacts with acid gases

to form a safe non-corrosive product that will not damage the equipment. When injected into the exhaust gas stream the dry powder forms bonds with SO<sub>2</sub>. The compounded material is then removed from the exhaust gas by existing emissions control equipment and collected with the ash. Test results at PRGS indicate that trona injection could consistently remove a significant portion of the SO<sub>2</sub> from exhaust gas while reducing particulate emissions. Particulate matter can form in the atmosphere when emitted gases, such as sulfur dioxide, condense; so when the amount of sulfur dioxide decreases, the amount of particulate matter is reduced accordingly.

#### **IV. Permit Description**

The Board has requested DEQ to develop State Operating Permits for three scenarios which require the establishment of emission limitations for SO<sub>2</sub> on both a short-term and a long term basis. This document describes permit Options 2 and 3 (Option 1 is discussed in another analysis). The emission limitations in Options 2 and 3 have been established to step down SO<sub>2</sub> emissions from the facility over a period of time beginning with an initial SO<sub>2</sub> limitation of 0.50 lbs/mmBtu and ending at a controlled rate of 0.28 lbs/mmBtu over a period of 9 months to 1 year. At the end of the period, annual emissions are capped at 3,500 tons of SO<sub>2</sub> from the facility.

The emission limitations established in permit Options 2 and 3 have not been modeled under all expected operating scenarios. The limitations reflect what is believed to be a reasonably expected level of SO<sub>2</sub> control for similar-sized pulverized coal combustion electric generating units. At this time it is not known whether these limitations are protective of the SO<sub>2</sub> NAAQS under all operating scenarios.

Both permit options continue the use of predictive modeling and SO<sub>2</sub> ambient air monitoring with associated action thresholds when monitored SO<sub>2</sub> concentrations at any ambient air monitor reach 70% of the National Ambient Air Quality Standards (NAAQS). Both permit options also require the continued operation of an SO<sub>2</sub> Continuous Emission Monitoring System (CEMS) to determine compliance with all SO<sub>2</sub> emission limitations.

#### **V. Best Available Control Technology Review (BACT) Applicability (9 VAC 5-50-260)**

A BACT applicability evaluation is not required for State Operating Permits.

#### **VI. 9 VAC 5 Chapter 50, Part II, Article 5 – NSPS**

The PRGS is not subject to 40 CFR 60 Subpart D – Fossil Fuel Steam Generators or Da – Electric Utility Steam Generating Units. Both NSPS apply to fossil fuel fired steam generators that are greater than 250 mmbtu/hr and commenced construction or modification after August 17, 1971 for Subpart D and September 18, 1978 for Subpart Da. All five boilers at the PRGS were constructed between 1949 and 1957 and have not previously been subject to either NSPS. Modification is defined in the NSPS regulations as physical or operational changes that result in an increase in hourly rates of emissions.

The PRGS is not subject to 40 CFR Subpart Db because the all boilers are larger than the 100-250 mmBtu/hr heat input capacity for applicability.

#### **VII. 9 VAC 5 Chapter 60, Part II, Article 1 – NESHAPS**

There is no applicable NESHAP for steam generating units.

#### **VIII. 9 VAC 5 Chapter 60, Part II, Article 2 – Maximum Achievable Control Technology (MACT)**

There are no applicable MACT requirements for steam generating units. The Boiler MACT (40 CFR 63 Subpart DDDDD) exempts electric utility steam generating units in section 63.7491(c).

#### **IX. Future Applicable Requirements**

The PRGS will be subject to the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR) effective January 1, 2009, for NO<sub>x</sub> and January 1, 2010, for SO<sub>2</sub>. Under Phase I CAIR, the facility will be allocated 701 tons of NO<sub>x</sub> emissions during the ozone season and 1,162 tons of NO<sub>x</sub> and 6,025 tons of SO<sub>2</sub> annually.

The facility will not be subject to the requirements of Best Available Retrofit Technology (BART) in EPA's Regional Haze Rule because all boilers were constructed between 1949 and 1957 and the BART applies to units constructed after August 7, 1962 but prior to August 7, 1977.

#### **X. Toxic Pollutants**

The facility is not subject to the state toxics rule. 9VAC 5-60-300 C.5. exempts stationary sources regulated by an emission standard in section 112 of the Clean Air Act. The facility will be subject to CAMR.

#### **XI. Title V Review - 9 VAC 5 Chapter 80, Article 1**

The facility is a Title V major source of sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>10</sub>), and carbon monoxide (CO). The VDEQ-Northern Virginia Region Office is currently drafting the Title V permit and Statement of Basis for the facility. All applicable requirements resulting from this permit action will be incorporated into the Title V permit.